Techniques for Reusing Experiences (T-REx) in Managerial Decision-Making Processes

Sonja Schulze

University of Osnabrueck, Department of Management Support Systems,
Katharinenstrasse 3, 49069 Osnabrueck, Germany
Sonja.Schulze@uni-osnabrueck.de

Abstract. This paper proposes a framework for experience-based decision support by analyzing the use and meaning of experiences in the business context. Two weak points in traditional approaches for reusing experiences e.g. CBR are addressed: First, the lack of adaptability to dynamic business situations and second the lack of analysis capabilities. Therefore, the use of decision support systems that help solving problems by reusing and analyzing experiences with business intelligence methods is proposed. In order to transfer the experiences into computable data a solution adequacy index is calculated that aggregates the single experiences to represent the compiled experience for a specific solution. The whole framework is illustrated by using the example of optimal supplier choice, finally applying two online analytical processing methods out of the BI domain to illustrate the solution adequacy index (SAI).

Keywords: Experience Management, Decision Support Systems (DSS), Business Intelligence (BI), Online Analytical Processing (OLAP)

1 Problem Definition and Research Question

The decision-making process in today's business environment is constantly changing and becoming more and more complex. The information used in one context can be irrelevant for another decision making situation. Therefore, systems to support managers in decision making have to be adaptable to the changing requirements. Not only the business environment is changing but also the decision maker and his needs vary. Business decisions require a wealth of experience that consists of compiled single experiences collected over the years, for example, the supplier choice based on previous order processing experiences. For decision makers in a job-rotation or training-on-the-job situation such decisions can be a huge challenge. Due to the lack of experiences they have to solve the problem more elaborately, and occasionally available experience management systems do not primarily focus on the aggregation of single experiences. Experiences can be found in internal as well as external sources in structured or semi-structured data. In addition to experience management systems also operational systems contain knowledge about problem-solving situations but the knowledge is often implicit and needs transformation to explicit knowledge [1].

Assuming that an experience management system with sophisticated analysis methods is missing, the decision maker has to browse the single experiences (order processes) in the operational systems and evaluate the solutions' adequacy (on-time delivery) to find the most appropriate solution (supplier). This leads to the research question: How to use and analyze experiences more efficiently for decision support?

2 Research background and Related Work

Experience management is defined as a special kind of knowledge management that deals with collecting, modeling, storing, reusing, evaluating and maintaining of experiences [2]. Experiences represent valuable, specific knowledge that was acquired in a previous problem-solving situation. For retrieval and adaption purposes the experiences are often represented in cases. One method to retrieve, adapt and reuse the cases is case-based reasoning (CBR). A CBR system uses experiences stored in cases to solve new problems by searching for a similar past case and reusing the adapted solution to the new problem [3]. The CBR system retrieves the most similar single experience and does not support the decision maker which solution to choose if a large number of similar past cases is retrieved. Furthermore, it needs an appropriate amount of cases to retrieve a proper case. In case of updates due to changing requirements (e.g. a relevant criterion is missing) the effort to update the CBR system is relatively high. Not only the case base including all the old cases has to be updated but also the similarity function must be adjusted. Hence the use of CBR systems in dynamic business situations is limited.

Decision support and business intelligence systems offer a set of tools such as data warehousing, data mining, online analytical processing (OLAP) and dashboards including a wide range of methods to store, access and analyze data [4]. For the multidimensional analysis of experiences OLAP applications well-known from DSS offer various functions e.g. dice, slice, roll-up or drill-down [5] and hence can be useful for ad-hoc analysis of experiences.

3 Research Methodology

The research methodology for the following research project is based on the design science research methodology (DSRM) [6] [7]. DSRM involves the design of successful artifacts created to solve observed problems. The lack of appropriate experience consideration in traditional decision support systems (problem identification) is met by the development of an experience-based decision support prototype (artifact) that brings together existing theories and knowledge of experience management and decision support. The utility, quality and efficiency of the prototype will be compared with a CBR and a spreadsheet-based DSS (evaluation) using the same database. Given a simple decision making situation the selected test group will apply all the alternative systems to find the most appropriate solution and evaluate the systems by predefined criteria.

4 Proposed Framework for Experience-based Decision Support

The research project suggests a combination of experience management and decision support / business intelligence systems. According to Bergmann's model for the communication between experience user and the experience management system the user is able to interact with the experience-based decision support system by defining and rating the experiences according to the specific demands.

Referring to the introductory example of supplier choice the most appropriate supplier for the next order is searched. The user has firstly to define the relevant experience by using individual criteria, e.g. the supplier reliability in a specific time period with a specific order size. The decision support system then has to derive the adequacy of a specific solution (e.g. the supplier reliability) from the aggregation of relevant single experience situations (e.g. order processes in period x). According to the changing requirements the attributes used to determine the solution adequacy (e.g. delivery within 14 days and reclamation rate less than 10%) have to be adaptable. For analysis purposes the calculated solution adequacy indexes (SAI) should be available in an OLAP application to benefit from the features of multidimensional (supplier reliability for a specific product in a specific period), hierarchical (per product – product group - overall) ad-hoc analysis that can be found in state-of-the-art decision support systems [4]. Figure 1 illustrates two possible ways to visualize the solution adequacy index in an OLAP application. The SAI – cube enables multidimensional, hierarchical analysis. For further analysis the SAI – matrix presents the possible solutions according to the relative rating and amount of retrieved experience to evaluate the reliability of the solution.

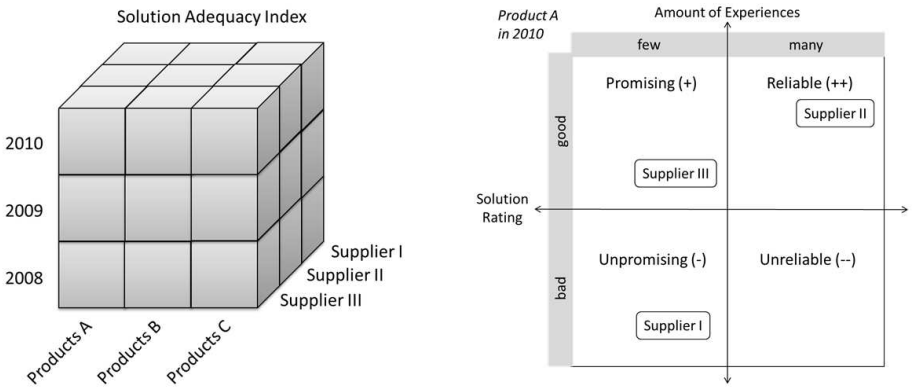

Fig. 1. SAI – Cube and SAI – Matrix to visualize the Solution Adequacy Index (SAI)

The next steps for this research project would be: Creating the user interface to define experiences with the available data, implementing a mechanism to evaluate the experiences by calculating a solution adequacy index and implementing a frontend with OLAP functions to present the results for decision support.

5 References

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